

# Rad-hard 1200 V SiC MOSFETs and Schottky Rectifiers for a 30 kW PPU, Phase I

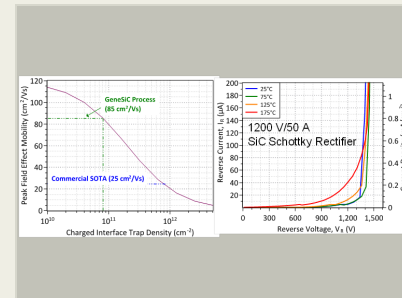
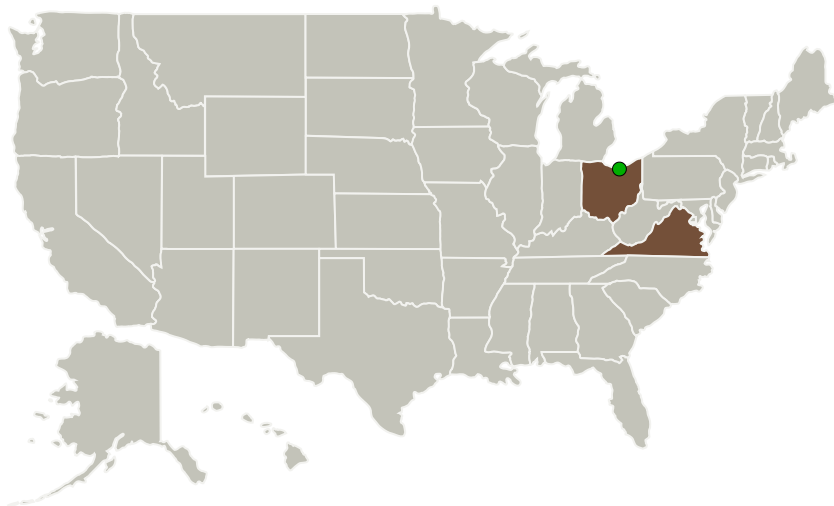
Completed Technology Project (2015 - 2015)



## Project Introduction

The proposed SBIR program targets the development of Rad-Hard by Design (RHBD), 1200 V-class SiC (planar) vertical DMOSFETs and power Schottky rectifiers for future NASA space missions. Single die ratings of  $> 1200$  V,  $> 75$  A,  $> 225^{\circ}\text{C}$  and compliance to a NASA-certified radiation hardness assurance program are targeted for the proposed SiC power devices. The target application for these devices involves a 30 kW power processor unit (PPU) on-board a Hall Thruster Propulsion System operating at a 300-400 V (average) DC bias with a peak voltage of 600 V. Several innovative device designs and process steps for fabricating RHBD SiC power DMOSFETs and Schottky rectifiers will be developed during Phase I. Building on the device development conducted during Phase I, the design and fabrication of traveled guided 1200 V/75 A SiC DMOSFET and Schottky rectifier wafer lots will be conducted during the Phase II program. The existing packaging techniques will be modified for meeting the required radiation standards from NASA. Selected die from both phases of the proposed program will be packaged in appropriate headers for controlled dose radiation testing as per NASA requirements. A rigorous space-level (JANS) qualification will be conducted on the fabricated devices during Phase II. Phase II will culminate with the insertion of the SiC power DMOSFETs and Schottky rectifiers into a 30 kW power processing unit (PPU) relevant to a NASA electric propulsion system and demonstrating stable operation.

## Primary U.S. Work Locations and Key Partners



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## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
GeneSiC Semiconductor Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Dulles, Virginia
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

## Primary U.S. Work Locations

Ohio	Virginia
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## Project Transitions

▶ **June 2015:** Project Start

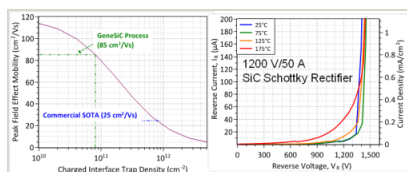
✓ **December 2015:** Closed out

**Closeout Summary:** Rad-hard 1200 V SiC MOSFETs and Schottky Rectifiers for a 30 kW PPU, Phase I Project Image

**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139359>)

## Images

**Briefing Chart Image**

Rad-hard 1200 V SiC MOSFETs and Schottky Rectifiers for a 30 kW PPU, Phase I  
(<https://techport.nasa.gov/image/131974>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

GeneSiC Semiconductor Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

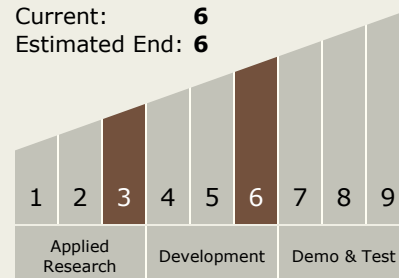
Carlos Torrez

**Principal Investigator:**

Siddarth G Sundaresan

## Technology Maturity (TRL)

Start: **3**  
Current: **6**  
Estimated End: **6**



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## Technology Areas

### Primary:

- TX03 Aerospace Power and Energy Storage
  - └ TX03.3 Power Management and Distribution
    - └ TX03.3.3 Electrical Power Conversion and Regulation

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System